

Docket No.: R2180.0159/P159
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Kazunari Kimino

Application No.: 10/609,634

Confirmation No.: 4954

Filed: July 1, 2003

Art Unit: 1791

For: APPARATUS AND METHOD FOR
MANUFACTURING SEMICONDUCTOR
DEVICE

Examiner: G. R. Koch

REQUEST FOR RECONSIDERATION
IN RESPONSE TO NON-FINAL OFFICE ACTION

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

The application has been carefully reviewed in light of the rejection dated November 12, 2008. Claims 5, 9, 27, 31, 36, and 39-44 are pending in the application. Applicant reserves the right to pursue the original claims and other claims in this and other applications.

Claims 41-44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ciardella I (US 5,711,989). This rejection is respectfully traversed.

Claim 41 recites an apparatus for manufacturing a semiconductor device comprising, *inter alia*, “a substrate holding unit for holding a semiconductor wafer substrate, wherein said semiconductor wafer substrate is provided with at least one electrode formed on a first surface thereof; a discharging mechanism for discharging droplets of raw sealant resin … onto said first surface of said semiconductor wafer substrate …; a drive mechanism for displacing at least one of said semiconductor wafer substrate …; [and] a control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode, … wherein a sealant resin layer having an uneven surface structure is formed from the raw sealant resin” (emphasis added). Applicant respectfully submits that Ciardella I does not disclose these limitations.

The Office Action asserts at page 4 that, although Ciardella I does not actually disclose the recited elements, it is “capable of” performing the claimed limitations. However, the limitation of “an uneven surface structure” requires a Z-axis control during resin discharge. Ciardella I discloses that “dots which are … ejected by the dot generator 12 are ejected while the dot generator 12 is moving along either the X, or Y axes, or both. [D]ots are not ejected while the dot generator 12 is being adjusted along the Z axes. Dots are thus ejected while the dot generator 12 is moving in the plane of the workpiece surface.” Col. 6, ln. 34-40. Although Ciardella I teaches at Col. 3, ln. 56-57 that dots can be dispensed at other heights, this is later discussed in Ciardella I as undesirable. *See* Col. 6, ln. 34-40. Thus, Ciradella I teaches away from such use.

It should also be noted that Bouras (US 5,906,682), which is cited later in the Office Action, and incorporates by reference the parent application of Ciardella I to disclose the apparatus that it employs (described below), discloses that an epoxy 18 and solder pads 14 completely cover the solder balls 12. Bouras FIGs. 2-3; Col. 1, ln. 48-50 and 58-67. Therefore, since the structure of Ciardella I is not "capable of" excepting the electrode from the resin, as claimed, Ciardella I cannot perform the claimed function. The Office Action also admits at page 24 that Ciardella I does not disclose a structure for forming a layer of the raw sealant resin excluding at least a portion of the electrode.

Ciardella I is completely silent with respect to any of the other limitations which the Office Action asserts that it is "capable of" performing. These assertions are without basis and speculative. Applicant also notes that M.P.E.P. § 2114 indicates that "the prior art cannot anticipate the claim if there is any structural difference." Claim 41 recites "a control unit for controlling said discharging mechanism..." which means that the control unit must be structurally formed to control the discharging mechanism in the claimed manner. Similarly, M.P.E.P. § 2115 does not apply here.

Applicant respectfully submits that Ciardella I does not disclose, teach, or suggest "a control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode," or that "a sealant resin layer having an uneven surface structure is formed" as recited in claim 41.

Since Ciardella I does not disclose all of the limitations of claim 41, claim 41 and dependent claims 42-44 are not anticipated by Ciardella I. Although the Office Action asserts at page 5 that Ciardella I is "capable of" forming "various structures," there is no actual disclosure in Ciardella I of any structures such as those recited in dependent claims 42-44. Applicant respectfully requests that the 35 U.S.C. § 102(b) rejection of claims 41-44 be withdrawn and the claims allowed.

Claims 36,40, and 41-44 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Bouras (US 5,906,682) with reference to Ciardella II (US 5,505,777) (incorporated by reference into Bouras). This rejection is respectfully traversed.

Claims 36 and 40 recite structural limitations similar to claim 41; therefore, Bouras, even with reference to Ciardella II, does not cure the above-discussed deficiencies of Ciardella I.

Specifically, Bouras discloses that an epoxy 18 and solder pads 14 completely cover the solder balls 12. FIGs. 2-3; Col. 1, ln. 48-50 and 58-67. Bouras further teaches that "it is desirable that enough liquid epoxy be deposited to encapsulate all of the electrical interconnections and so that a fillet 18a is formed along the side edges of the chip 10." Col. 2, ln. 16-19. This teaches away from a control unit adapted to control a discharging head to leave a portion of the electrode exposed, as recited in claims 36 and 40. Applicant respectfully submits that Bouras does not disclose, teach, or suggest that "raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode," as recited in claims 36, 40, and 41. The Office Action also admits at page 27 that Bouras does not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode.

The limitation of “an uneven surface structure” requires a Z-axis control during resin discharge. Ciardella II discloses that “dots which are . . . ejected by the dot generator 12 are ejected while the dot generator 12 is moving along either the X, or Y axes, or both. Typically, dots are not ejected while the dot generator 12 is being adjusted along the Z axes. Dots are thus ejected while the dot generator 12 is moving in the plane of the workpiece surface.” Col. 6, ln. 42-47. Although Ciardella II teaches at Col. 3, ln. 65-66 that dots can be dispensed at other heights, this is later discussed in Ciardella II as undesirable. *See* Col. 6, ln. 42-47. Thus, Bouras/Ciadella II teach away from such use.

Since Bouras (even with Ciardella II) does not disclose all of the limitations of claims 36, 40, and 41, claims 36, 40, and 41 are not anticipated by Bouras. Claims 42-44 depend, respectively, from independent claim 41, and are patentable at least for the reasons mentioned above, and on their own merits. Applicant respectfully requests that the 35 U.S.C. § 102(b) rejection of claims 36, 40, and 41-44 be withdrawn and the claims allowed.

Claims 5, 9, 27, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I in view of Nakazawa (US 5,935,375). This rejection is respectfully traversed. Claims 5, 9, 27, and 31 recite structural limitations similar to claim 36; therefore, Nakazawa, which was cited for teaching other limitations, does not cure the above-discussed deficiencies of Ciardella I. The Office Action also admits at page 34 that Ciardella I does not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Thus, Nakazawa does not remedy the deficiencies of Ciardella I. Since Ciardella I and Nakazawa do not teach or suggest all of the limitations of claims 5, 9, 27, and 31, claims 5, 9, 27, and 31 are not obvious over the cited combination. Applicant

respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, and 31 be withdrawn and the claims allowed.

Claims 36 and 40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I in view of Bouras. This rejection is respectfully traversed.

As discussed above, Bouras discloses that an epoxy 18 and solder pads 14 completely cover the solder balls 12. FIGs. 2-3; Col. 1, ln. 48-50 and 58-67. Bouras further teaches that "it is desirable that enough liquid epoxy be deposited to encapsulate all of the electrical interconnections and so that a fillet 18a is formed along the side edges of the chip 10." Col. 2, ln. 16-19. This teaches away from a control unit constructed to control a drive mechanism to leave a portion of the electrode exposed, as claimed. Applicant respectfully submits that Bouras does not disclose, teach, or suggest a "control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode," as recited in claims 36 and 40. The Office Action also admits at page 36 that Bouras does not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Nor is Ciardella I cited for these limitations. As discussed above, Ciardella I does not teach the cited limitations. Thus, Ciardella I does not remedy the deficiencies of Bouras.

Since Bouras and Ciardella I do not teach or suggest all of the limitations of claims 36 and 40, claims 36 and 40 are not obvious over the cited combination. Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 36 and 40 be withdrawn and the claims allowed.

Claims 5, 9, 27, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bouras and Ciardella II in view of Nakazawa. This rejection is respectfully traversed.

As discussed above, Bouras discloses that an epoxy 18 and solder pads 14 completely cover the solder balls 12. FIGs. 2-3; Col. 1, ln. 48-50 and 58-67. Bouras further teaches that "it is desirable that enough liquid epoxy be deposited to encapsulate all of the electrical interconnections and so that a fillet 18a is formed along the side edges of the chip 10." Col. 2, ln. 16-19. This teaches away from a control unit constructed to control a drive mechanism to leave a portion of the electrode exposed. Applicant respectfully submits that Bouras does not disclose, teach, or suggest that "control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode," as recited in claims 5, 9, 27, and 31. The Office Action also admits at page 42 that Bouras and Ciardella II do not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Nor is Nakazawa cited for these limitations. Thus, Nakazawa does not remedy the deficiencies of Bouras.

Since Bouras, Ciardella II, and Nakazawa do not teach or suggest all of the limitations of claims 5, 9, 27, and 31, claims 5, 9, 27, and 31 are not obvious over the cited combination. Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, and 31 be withdrawn and the claims allowed.

Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I in view of Prentice (US 6,007,631). This rejection is respectfully traversed. Claim 39 recites limitations similar to those discussed above for claims 5, 9, 27, and 31; therefore, Prentice, which was cited for teaching other limitations,

does not cure the above-discussed deficiencies of Ciardella I. The Office Action also admits at page 45 that Ciardella I does not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Thus, Prentice does not remedy the deficiencies of Ciardella I. Since Ciardella I and Prentice do not teach or suggest all of the limitations of claims 5, 9, 27, 31, and 39, claims 5, 9, 27, 31, and 39 are not obvious over the cited combination. Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, 31, and 39 be withdrawn and the claims allowed.

Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bouras and Ciardella II in view of Prentice. This rejection is respectfully traversed.

As discussed above, Bouras discloses that an epoxy 18 and solder pads 14 completely cover the solder balls 12. FIGs. 2-3; Col. 1, ln. 48-50 and 58-67. Bouras further teaches that “it is desirable that enough liquid epoxy be deposited to encapsulate all of the electrical interconnections and so that a fillet 18a is formed along the side edges of the chip 10.” Col. 2, ln. 16-19. This teaches away from a control unit constructed to control a drive mechanism to leave a portion of the electrode exposed. Applicant respectfully submits that Bouras does not disclose, teach, or suggest “a control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode,” as recited in claims 5, 9, 27, 31, and 39. The Office Action also admits at page 48 that Bouras and Ciardella II do not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Nor is Prentice cited for these limitations. Thus, Prentice does not remedy the deficiencies of Bouras.

Since Bouras, Ciardella II, and Prentice do not teach or suggest all of the limitations of claims 5, 9, 27, 31, and 39, claims 5, 9, 27, 31, and 39 are not obvious over the cited combination. Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, 31, and 39 be withdrawn and the claims allowed.

Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I in view of Cavallaro (US 6,017,392). This rejection is respectfully traversed. Cavallaro, which was cited for teaching other limitations, does not cure the above-discussed deficiencies of Ciardella I. The Office Action also admits at page 51 that Ciardella I does not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Thus, Cavallaro does not remedy the deficiencies of Ciardella I. Since Ciardella I and Cavallaro do not teach or suggest all of the limitations of claims 5, 9, 27, 31, and 39, claims 5, 9, 27, 31, and 39 are not obvious over the cited combination. Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, 31, and 39 be withdrawn and the claims allowed.

Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bouras and Ciardella II in view of Cavallaro. This rejection is respectfully traversed. As discussed above, Bouras discloses that an epoxy 18 and solder pads 14 completely cover the solder balls 12. FIGs. 2-3; Col. 1, ln. 48-50 and 58-67. Bouras further teaches that “it is desirable that enough liquid epoxy be deposited to encapsulate all of the electrical interconnections and so that a fillet 18a is formed along the side edges of the chip 10.” Col. 2, ln. 16-19. This teaches away from a control unit constructed to control a drive mechanism to leave a portion of the electrode exposed. Applicant respectfully submits that Bouras does not disclose, teach, or suggest that “control unit for controlling said discharging mechanism and said drive mechanism such that said raw

sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode," as recited in claims 5, 9, 27, 31, and 39. The Office Action also admits at page 55 that Bouras and Ciardella II do not disclose forming a layer of the raw sealant resin excluding at least a portion of the electrode. Nor is Cavallaro cited for these limitations. Thus, Cavallaro does not remedy the deficiencies of Bouras.

Since Bouras, Ciardella II, and Cavallaro do not teach or suggest all of the limitations of claims 5, 9, 27, 31, and 39, claims 5, 9, 27, 31, and 39 are not obvious over the cited combination. Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, 31, and 39 be withdrawn and the claims allowed.

All of the above rejections were repeated with the addition of Sahara (US 6,713,880). Claims 41-44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I in view of Sahara. Claims 36,40, and 41-44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bouras with reference to Ciardella II in view of Sahara. Claims 5, 9, 27, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I and Sahara in view of Nakazawa. Claims 36 and 40 stand rejected under 35 U.S.C. § 102(a) as being unpatentable over Ciardella I in view of Bouras. Claims 5, 9, 27, and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bouras/Ciardella II, and Sahara in view of Nakazawa. Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I and Sahara in view of Prentice. Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bouras, Ciardella II, and Sahara in view of Prentice. Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ciardella I in view of Cavallaro. Claims 5, 9, 27, 31, and 39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable

over Bouras and Ciardella II in view of Cavallaro. These rejections are respectfully traversed.

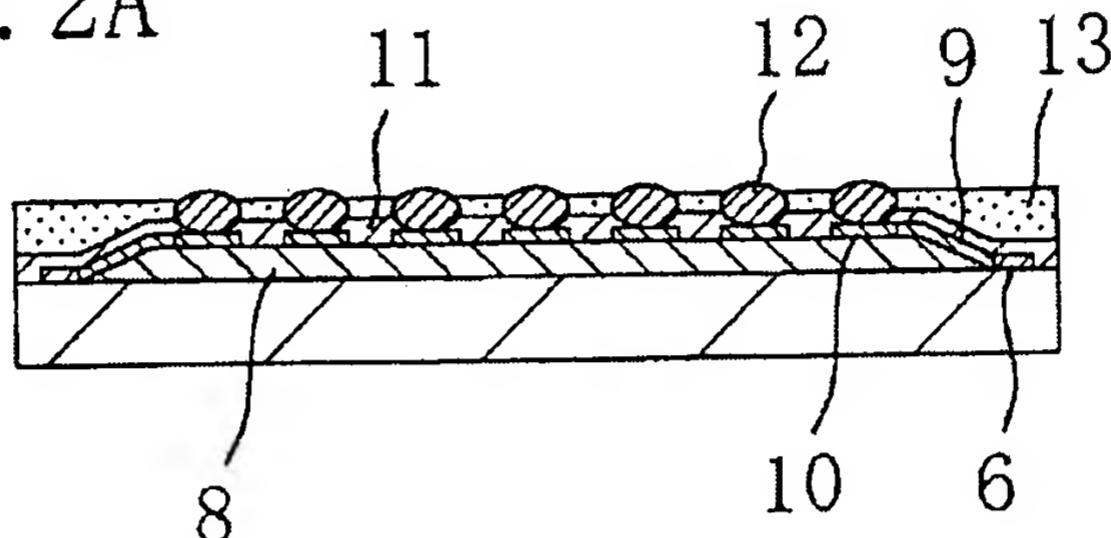
Claim 41 recites an apparatus for manufacturing a semiconductor device comprising, *inter alia*, “a substrate holding unit for holding a semiconductor wafer substrate, wherein said semiconductor wafer substrate is provided with at least one electrode formed on a first surface thereof; a discharging mechanism for discharging droplets of raw sealant resin ... onto said first surface of said semiconductor wafer substrate ...; a drive mechanism for displacing at least one of said semiconductor wafer substrate ...; [and] a control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said semiconductor wafer substrate excluding at least a portion of said electrode.” Claims 5, 9, 27, 31, 36, 39, and 40 recite similar limitations. Claim 41 further recites that the control unit is constructed to control the discharging mechanism such that “a sealant resin layer having an uneven surface structure is formed from the raw sealant resin.” Applicant respectfully submits that Sahara, even when combined with any of the other cited references, does not disclose these limitations.

In addition to the discussions above with respect to the various rejections, Sahara teaches in FIG. 2A (reproduced below on the next page) that an “underfill material layer 13 is formed on the insulative resin layer 11.” Col. 7, ln. 10-11. The underfill layer 13 that is cited in the Office Action for teaching the claimed layer of raw sealant resin is not in contact with the substrate 7. Applicant respectfully submits that Sahara does not disclose, teach, or suggest “a control unit for controlling said discharging mechanism and said drive mechanism such that said raw sealant resin is attached to said first surface of said

semiconductor wafer substrate excluding at least a portion of said electrode," as recited in claim 12.

Sahara FIG. 2A)

FIG. 2A



As noted above, the Office Action admits that Bouras, Ciardella I, and Ciardella II do not teach these limitations. Thus, none of Bouras, Ciardella I, or Ciardella II remedies the deficiencies of Sahara. Nakazawa, Prentice, and Cavallaro were cited for other limitations, and do not cure these deficiencies, either.

Since Sahara, combined with any of the other cited references, does not teach all of the limitations of claims 5, 9, 27, 31, 36, 39, and 40-41, claims 5, 9, 27, 31, 36, 39, and 40-41 are not obvious over the cited combinations.

Claims 42-44 depend from claim 41, and are patentable at least for the reasons mentioned above, and on their own merits. For example, although the Office Action asserts at page 5 that Ciardella I is "capable of" forming various structures, there is no actual disclosure in Ciardella I of any structures such as the control unit as recited in dependent claims 42-44. Furthermore, although the Office Action asserts at page 25 that "Sahara suggests that [the cited] numerical limitations are obvious," there is no citation as to how or where Sahara makes such a suggestion.

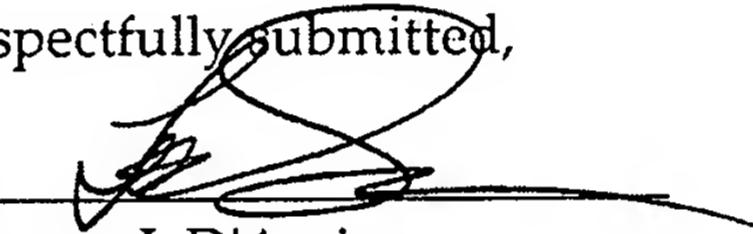
In addition, the Office Action asserts at page 25 that Sahara includes a motivation for using the claim 42 concave structure at Col. 10, ln 19-21. However, this passage actually refers to a motivation for using a raised fillet (i.e., convex, not concave) which encloses the electrode. This also directly contradicts the concave limitation of claim 44.

Applicant respectfully requests that the 35 U.S.C. § 103(a) rejection of claims 5, 9, 27, 31, 36, 39, and 40-44 be withdrawn and the claims allowed.

In view of the above, Applicant believes the pending application is in condition for allowance.

Dated: February 4, 2009

Respectfully submitted,

By 
Thomas J. D'Amico

Registration No.: 28,371
Rachael Lea Leventhal
Registration No.: 54,266
DICKSTEIN SHAPIRO LLP
1825 Eye Street, NW
Washington, DC 20006-5403
(202) 420-2200
Attorneys for Applicant